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## **CLAIMS**

I CLAIM AS MY INVENTION:

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claims a confestion

- 1. A thermal barrier coating material comprising a cubic matrix structure of ZrO<sub>2</sub> stabilized by a concentration of Y<sub>2</sub>O<sub>3</sub> greater than that concentration of Y<sub>2</sub>O<sub>3</sub> that would result in a peak ionic conductivity in the matrix.
  - 2. The thermal barrier coating material of claim 1, further comprising at least 30 wt.  $\% Y_2O_3$ .
  - 3. The thermal barrier coating material of claim 1, further comprising at least 40 wt. %  $Y_2O_3$ .
  - 4. The thermal barrier coating material of claim 1, further comprising at least 50 wt. % Y<sub>2</sub>O<sub>3</sub>.
  - 5. A thermal barrier coating material comprising a cubic matrix structure of  $ZrO_2$  stabilized by a concentration of  $Y_2O_3$ , wherein the concentration of  $Y_2O_3$  is sufficiently high to create a quantity of multi-vacancy defect clusters in the cubic matrix structure such that the material exhibits a resistance to sintering measured as linear shrinkage to be less than 4000 ppm after exposure to 1400 °C. for 24 hours.
  - 6. A thermal barrier coating material comprising a cubic matrix structure of a rare earth oxide selected from the group of zirconia, hafnia and titania and containing a stabilizer selected from the group of lanthia, ytterbia and yttria, the material comprising a concentration of the stabilizer greater than that concentration of the stabilizer that would result in a peak ionic conductivity in the matrix.
- 7. The thermal barrier coating material of claim 6, further comprising at least 30 30 wt. % stabilizer.

- 8. The thermal barrier coating material of claim 6, further comprising at least 40 wt. % stabilizer.
- 9. The thermal barrier coating material of claim 6, further comprising at least 50 wt. % stabilizer.
  - 10. A thermal barrier coating material comprising a cubic matrix structure of HfO<sub>2</sub> stabilized by a concentration of a rare earth oxide that is greater than that concentration of the rare earth oxide that would result in a peak ionic conductivity in the matrix.
  - 11. The thermal barrier coating of claim 10, wherein the rare earth oxide comprises Gd<sub>2</sub>O<sub>3</sub>.
  - 12. The thermal barrier coating material of claim 11, further comprising at least 30 wt. %  $Gd_2O_3$ .
  - 13. The thermal barrier coating material of claim 11, further comprising at least 40 wt. % Gd<sub>2</sub>O<sub>3</sub>.
  - 14. The thermal barrier coating material of claim 11, further comprising at least 50 wt. % Gd<sub>2</sub>O<sub>3</sub>.

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